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| 10/611,992 | 07/03/2003 | Jae-Hyun Ryou | H0004618-US | 3405 |

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| EXAMINER | |
|---|---|
| RODRIGUEZ, ARMANDO | |
| **ART UNIT** | **PAPER NUMBER** |
| 2828 | |

DATE MAILED: 12/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/611,992 | RYOU, JAE-HYUN | |
| | Examiner | Art Unit | |
| | ARMANDO RODRIGUEZ | 2828 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) 1-17 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-17 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 2-19-2004.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 6, 10 and 11 are rejected under 35 U.S.C. 102(e) as being anticipated by Chang et al (US 6,765,238).

Regarding claims 1, 10 and 11,

Figure 7 illustrates vertical cavity surface emitting laser (VCSEL) having a substrate (420) [applicant's substrate], a DBR (430) [applicant's first mirror], an active region (412) [applicant's active region], tunnel junction (302) [applicant's tunnel junction] and a DBR (432) [applicant's second mirror]. Column 12 line 11-12 discloses an InP substrate. Column 13 lines 18-21, discloses a p-type tunnel junction layer (306) composed of InGaAs and column 17 lines 40-42, discloses either n-type or p-type tunnel junction layers as being pseudomorphically.

Regarding claim 6,

Column 9 lines 4-5, discloses the tunnel junction grown by MOCVD.

Regarding claims 7 and 13,

Column 8 lines 6-16, discloses the p-type tunnel junction doped with carbon and discloses a hole concentration of $1.3X10^{20}$ $cm^{-3}$.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 11-14, 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Sekiguchi et al (Jpn. J. Appl. Phys.).

Regarding claim 11,

Page 443 second column second paragraph describes a tunnel junction having a p-type layer composed of AlAs.

Regarding claim 12,

Page 443 second column second paragraph discloses tunnel junction structure having a Zn-doped InGaAsP.

Regarding claim 13,

Page 443 second column second paragraph discloses the p-type AlAs layer having a concentration of $1X10^{19}$ $cm^{-3}$.

Regarding claim 14,

Page 443 second column second paragraph describes a tunnel junction structure having an n-type InP layer.

Regarding claim 16,

Page 443 second column second paragraph describes a tunnel junction structure having an n-type InP layer with a thickness of 100 angstrom [applicant's 10 nanometer].

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2, 9, 15 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al (US 6,765,238) as applied to claims 1 and further in view of Sekiguchi et al (Jpn. J. Appl. Phys.).

Regarding claim 2,

Chang et al does disclose a vertical cavity surface emitting laser (VCSEL) with a tunnel junction but is silent as to the tunnel junction including Zn doped layer.

Sekiguchi et al discloses in page 443 second column second paragraph a tunnel junction structure having a Zn-doped InGaAsP.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the tunnel junction structure of Sekiguchi et al with the VCSEL of Chang et al because it will provide a long wavelength laser.

Regarding claim 9,

Chang et al does disclose a vertical cavity surface emitting laser (VCSEL) with a tunnel junction but is silent as to the tunnel junction including an n-doped layer consisting of InP, ALInAS, AlInGaAsP ro InGaAsP.

Sekiguchi et al discloses in page 443 second column second paragraph a tunnel junction structure having an n-type InP layer.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the tunnel junction structure of Sekiguchi et al with the VCSEL of Chang et al because it will provide a long wavelength laser.

Regarding claims 15 and 17,

Cahng et al discloses in page 443 second column second paragraph describes a tunnel junction structure having an n-type InP layer with a thickness of 100 angstrom [applicant's 10 nanometer].

Sekiguchi et al discloses in page 443 second column second paragraph an n-type InP tunnel junction layer having a concentration of $1X10^{19}$ $cm^{-3}$.

Chang et al and Sekiguchi et al are silent as to the concentration of n-type InP layer being greater than $5X10^{19}$ $cm^{-3}$.

However, in accordance with MPEP 2144.05

A prima facie case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. Titanium Metals Corp. of America v. Banner, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985) (Court held as proper a rejection of a claim directed to an alloy of "having 0.8% nickel, 0.3% molybdenum, up to 0.1% iron, balance titanium" as obvious over a reference disclosing alloys of 0.75% nickel, 0.25% molybdenum, balance titanium and 0.94% nickel, 0.31% molybdenum, balance titanium.).

In the instant application the concentration of the n-type InP tunnel junction of Sekiguchi et al is within the same exponential range as the recited concentration thereby both concentrations would provide the same effects within the tunnel junction structure, which is to obtain a long wavelength VCSEL as described by Sekiguchi et al in the abstract and as described by applicant in page 2 lines 4-6 of the specification.

Claims 3, 4, 5 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al (US 6,765,238) as applied to claims 1 and further in view of Bour et al (US 2004/0161013).

Regarding claims 3, 4 and 5,

Chang et al discloses a vertical cavity surface emitting laser (VCSEL) with a tunnel junction and n-type DBR, column 13 lines 5-9.

Chang et al is silent as to the VCSEL having spacer layers.

Bour et al illustrates in figure 1 a VCSEL having a tunnel junction (17), DBR (12) and (14) and spacers (17) and (18).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the spacer of Bour et al with the VCSEL of Chang et al because it will provide a correct resonant wavelength for the cavity, paragraph [0009] of Bour et al.

Regarding claim 8,

Chang et al does disclose the use of InP substrate but is silent as to the composition of the active region.

However, it is well known in the art to use an active layer from the InP when the substrate is Indium based, as disclosed by Bour et al in paragraph [0010], where the active region may be selected from material as InP, AlGaInP, InGaAsP and AlGaInAs.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ARMANDO RODRIGUEZ whose telephone number is 571-272-1952. The examiner can normally be reached on 9:00 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MINSUN HARVEY can be reached on 571-272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ARMANDO RODRIGUEZ
Examiner
Art Unit 2828

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